Prospects and Limitations of Expansion of Irrigation in Bangladesh

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Abstract
Bangladesh possesses abundant water resources but faces challenges in harnessing them for efficient irrigation. This paper examines the current state of irrigation in the country, highlighting the gap between potential and actual irrigated areas. It discusses major irrigation projects, including the proposed Ganges Barrage Project and the Teesta River Comprehensive Management and Restoration project. The paper emphasizes the need for new projects and strengthened institutions to realize the full potential of irrigation for food security in Bangladesh.

Keywords: Bangladesh, irrigation, water resources, Ganges Barrage Project, Teesta River, agriculture, food security.

1 Introduction

Bangladesh is rich in naturally gifted water resources with its 907 active rivers [2], 373 haors [3], 23 ox-bow lakes (or baors) and 1,622 beels [4], some artificial lakes, and other wetlands also. It is fortunate that with the presence of such rivers and wetlands, the country is not a desert. As rainfall varies considerably in its place of occurrence as well as in its amount, crops cannot be raised successfully without artificial irrigation of fields. To utilize the water of these rivers and wetlands, irrigation infrastructures are needed. Irrigation may use groundwater and surface water, the latter being preferable.

2 Irrigation Coverage

According to 2020 BADC data, net cultivable area in Bangladesh is about 8,585,207 hectares (ha) where total irrigated area is 5,587,482 ha, which is about 65% of net cultivable area. Only 0.8 % of GDP of Bangladesh is expended in water resource sector. Irrigation is a tiny fraction of this sector.

Bangladesh Water Development Board (BWDB), Bangladesh Agricultural Development Corporation (BADC), Barind Multipurpose Development Authority (BMDA) and Local Government Engineering Department (LGED) implement irrigation projects. However their combined schemes is yet less than irrigation managed by farmers as shown in the following figure:

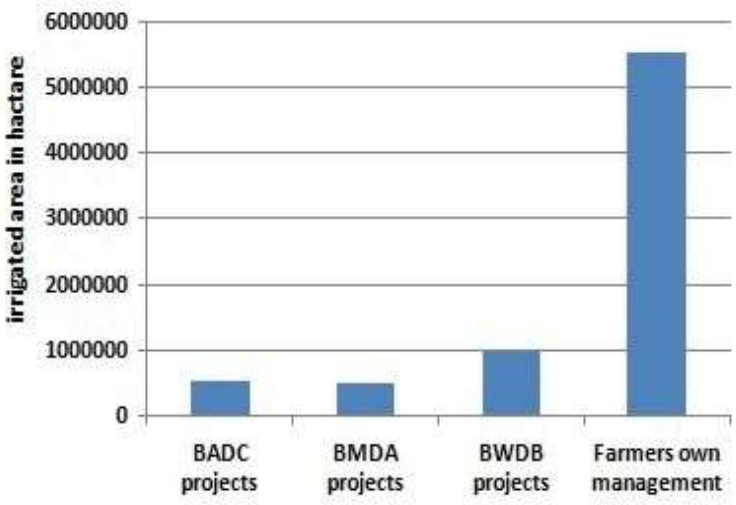

Figure: contribution of agencies in the country's irrigation (in 2020)

It is worth mentioning that irrigation managed by farmers is unplanned, expensive and inefficient.

2.1 Major funtioning irrigation projects

In the following table, major funtioning irrigation projects are listed (arranged chronologically):

Table: Major funtioning irrigation projects (upto 2020)

Project name, period	Agency	Location (district)	description
The Ganges-Kobadak Irrigation Project (G-K Project) Phase I: 1955-1970, Phase II: 1960-1981	Irrigation Dept (extinct), EPWAPDA (extinct), BWDB	Kushtia, Chuadanga, Jhenaidaha and Magura	provides irrigation facilities to 69,599 hactares (ha) of land by water lifted from the Ganges by pumps.
Buriteesta Irrigation Project 1960-1967	Irrigation Dept. (extinct), EPWAPDA (extinct), BWDB	Nilphamari	First Barrage in the then East Bengal was constructed under this project. Provides irrigation to 1,940 ha.
Sonaichhari FCDI 1963	BARD, BWDB	Comilla	provides irrigation to 4,390 ha and flood protection to 12,000 ha.
Chandpur Irrigation Project 1963-1978	Irrigation Department, EPWAPDA (extinct), BWDB	Chandpur and Lakshmipur	provides irrigation to 15,820 ha and drainage facilities to 53,000 ha.
Manu River Project 1975-1993	BWDB	Maulvibazar	provides irrigation to 10,252 ha by diverting water from the Manu river by a barrage
Karnafuli River Project 1975-1983	BWDB	Chittagong	provides irrigation to 8,095 ha.
Barisal Irrigation Project BIP Phase I: 1975-1980 Phase II: 1980-1982	BWDB	Barisal, Jhalokathi, Pirojpur	provides irrigation to 26085 ha.
Muhuri Irrigation Project 1977-1986	BWDB	Feni	provides irrigation to 10,308 ha.
Meghna-Dhonagoda Project 1979-1988	BWDB	Chandpur	provides irrigation to 4,875 ha.
Shovondondi Water Control Structure 1980-1981	BWDB	Chittagong	provides irrigation to 4,000 ha.
Katakhali Water Control Structure 1981-1983	BWDB	Chittagong	provides irrigation to 2,750 ha.
Teesta Barrage Project Phase I: 1981-1998, Phase II: 1998-2000	BWDB	Rangpur, Lalmonirhat and Nilphamari	provides irrigation to 40,500 ha.
Pabna Irrigation Project 1983-1992	BWDB	Pabna	provides irrigation to 2,502 ha.

The NWP (1999) states "the Local Government will implement flood control, drainage and irrigation (FCDI) projects having command areas of 1,000 hectares or less" Such small projects are not included in the Table.
In most of the projects, much of the area is not irrigated; example shown in the following Table.

Table: area without irrigation in irrigation projects (2020)

Project	Irrigable area in project area	Irrigated area in project area	% not irrigated in irrigable area
G-K Project	95,616	69,599	27%
Buriteesta Irrigation Project	2,151	1,940	10%
Teesta Barrage Project	83,008	40,500	51%
Pabna Irrigation Project	13282	2,502	81%

2.2 Widely discussed proposed irrigation projects

There is need to implement large-scale irrigation projects in northern and western part of the country. The projects listed in the table are much discussed.

Table: proposed irrigation projects

Project name, period	Agency	Location (district)	description
Teesta River Comprehensive Management and Restoration project	BWDB	Rangpur, Lalmonirhat and Nilphamari	
Ganges Barrage Project	BWDB	Districts of Greater Rajshahi, Faridpur, Kushtia, Pabna, Barisal, Khulna and Jessore.	If implemented, it could provide irrigation to 1.9 million ha land in Ganges Dependent Area.

2.2.1 Some information on proposed Teesta River Comprehensive Management and Restoration project

The Teesta originates from Tso Lhamo lake in Sikkim. After commissioning of Gajoldoba barrage in India, the minimum flow of the Teesta river in Bangladesh has declined from about 200 cumec to below 40 cumec. Furthermore, the Indian authorities are planning to build about 15 more diversionary structures on the upstream reaches of the Teesta and its tributaries. The river's flow at the Gajoldoba point will decrease in the future, shrinking further the dry season flow in Bangladesh [5].

In 1990 operation of the Teesta barrage started in Bangladesh. But due to decrease in flow the reservoir capacity needs to be enhanced. Md. Khalequzzaman wrote, “Being neglected and frustrated by India’s unilateral control of the natural flow of the river and by not being able to reach any agreement about water sharing, the government of Bangladesh has recently signed an agreement with a Chinese agency called Power China to borrow $853 million, and with their technical assistance to undertake the Teesta River Comprehensive Management and Restoration project [6]. Bangladesh foreign ministry spokesperson announced in 2023, “China has expressed interest to support development projects on the Bangladesh side of the Teesta River.” [7]

Experts opined that in case of unavailability of foreign assistance, the project can be implemented own technology and own financing. [8]

Teesta Barrage (Credit: Masnad, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons)

2.2.2 Some information on proposed Ganges Barrage Project

The reduced dry season flow has altered the hydrological pattern of Bangladesh part of the basin, inducing accelerated sedimentation in the Gorai River (a branch of the Ganges) and helping saline water to penetrate further inland from the sea. [9] The Mathabhanga, the Chandana-Barasia, the Baral and the Ichamati (Pabna) also suffer from less flow in the Ganges. With less and less flow, navigation facility is decreased, ground water depleted and arsenic contamination increased. Flow in the Mahananda is also decreasing. Mahananda barrage at Fulbari on Mahananda river was built by India only 1.3km u/s from the point of entry of the river into Bangladesh in Tentulia upazilla, Panchagarh District.

Amanur Rahman writes Bangladesh does not get its due share contained in the treaty signed in 1996 on the Ganges water distribution. [10]

To ensure the best utilization of the water that enters into Bangladesh the Ganges Barrage Project (GBP) was planned. From the available BBS data, it is estimated that in proposed tolal area under proposed GBP (5.188 million ha), 33% area is single cropped and 4.1% area fallow land. According to DAE, BADC and BMDA data, 78% irrigation is done by ground water and 22% irrigation is done by surface water in proposed tolal area under proposed GBP.

Detailed design of the barrage has been already completed by BWDB. In Dec 2010, the inter-ministerial Steering Committee of GBSP approved selection of barrage site at Pangsha in Rajbari district. The design has been reviewed by independent academic and international experts. The reservoir is designed is over 100 km long, with a pond area of 625 square km and capacity of 2890 million cubic meter. [11]

Anandabazar Patrika reported that India's Central Water Commission representatives visited Dhaka and Paksey in October 2017; meetings held between Technical Team from the Indian and Bangladesh side with Bhopal Singh of CWC and Abdul Hai Baqui of BWDB as heads of the teams respectively. The both side agreed that GBP will be good for both the countries. Water scarcity from Suti to Dhulian-Jalangi will be mitigated. But West Bengal CM Mamata Banerjee expressedr objection to the Ganges barrage project stating it may cause flooding in parts of the State. [12]

There is no reason for mistrust as the barrage site is so located that backwater does not cross the Indian territory. Design pond level of the proposed barrage is 12.5 meter PWD while danger level of the Ganges at Farakka is 18.50meter PWD. [13] There is no opinion from technical community that the barrage design might be faulty. Concern about backwater effect is mentioned in the newspaper report. In the location of the barrage, the river width will be constricted and flow velocity will be increased. The recent research at UNESCO-IHE on river morphodynamics shows that river bed level and corresponding water level is lowered upstream of a constriction in long term. [14]

Mr. Abdul Aziz, retired officer of BWDB, opined that the proposed GBP is not a project worth abandoning. [15] Although aborted in 2017, the GBP was included in Delta Plan 2100 with estimated cost US$ 5.15 billion.

Balancing surface water utilization with groundwater preservation is essential for long-term water security. In Perspective Plan 2010-2021, "Focus on surface water irrigation and stabilize a reduced use of groundwater" is mentioned as Long-term Water Resource Management Strategies. [16] Without GBP and TRCMRP this cannot be achieved.

3.2 Organizational strength in irrigation sector

According to Planning Commission, Ministry of Water Resources is the main institution for water management in the country. Its activities are implemented with help of BWDB and WARPO and some other organizations. Both organizations need to be strengthened. [17]

Faruqee and Yusuf mentioned, "The Water Development Board (BWDB), whose original mandate was to develop physical infrastructure like dams, embankments, canals, etc. is the best organization for design and implementation of major water projects." [18]

BWDB has its organizational problems also as Mahbubur Rahman Khan commented that BWDB "has been handicapped ever since the government curtailed its autonomy". [19] Due to curtailing incentives as compared to other government organizations, lack of motivation is present. As autonomy has been lost, there is demand for transforming BWDB into a department and encadrement of its officials. [20] Without strengthening BWDB with manpower, logistics and incentives, it is difficult to get better service.

Conclusion:

While Bangladesh boasts abundant water resources, uneven rainfall patterns necessitate irrigation. The current irrigation coverage is limited. Large-scale projects like the GBP and the TRCMRP offer promising solutions, but require overcoming political hurdles. Investing in robust irrigation infrastructure and strengthening water management institutions are crucial steps. By implementing new irrigation projects, Bangladesh can ensure its food security for future generations.

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